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SEASONAL VARIATION IN THE POPULATIONS OF *MOINA MACROCOPA* STRAUSS AND *MOINA MICRURA* KURZ (CRUSTACEA : CLADOCERA) IN ZOAFARANIYA*H* POOLS

A. N. KHALAF
Biological Research Centre, Adhamiyah, Baghdad
and
A. F. SHIHAB
Department of Biology, College of Science, University of Basrah, Basrah, Iraq

Many cladoceran species were listed from several parts of Iraq (Gurney 1921, Mohammad 1965, Khalaf and Smirnov 1976). But there is little information concening biological and ecological aspects of some of these species. However Khalaf *et. al.* (1977, 1978) studied the growth of *Simocephalus vetulus* Schodler under different food conditions and Lazim (1977) did a bio-ecological study on *Daphnia lumholtzi* Sars. Moreover Shihab (1977) has investigated the relationship between some environmental factors and the growth, reproduction and longevity of *Moina micrura* Kurz. The present work is an attempt for making a comparison between *Moina macrocopa* Strauss and *M. micrura* in respect of their seasonal population changes in Zoafaraniyah pools, Baghdad.

MATERIALS AND METHODS

Samples were taken at about weekly intervals from 1st July 1976 to 30th June 1977 at 10 a.m. Specimens were then preserved in 4% formalin in small specimen bottles. Ten subsamples of one ml each were taken from the original samples by a pipette and the number of animals were counted under a microscope. The number of animals per liter was then calculated.

Water and air temperatures were measured with a mercury thermomater and the determination of dissolved oxygen was carried out according to Winkler method as described by Welsh and Smith (1967). The pH was determined using a pH meter model 388. The chlorisity of habitat water was measured by the titration method with (0·02) N AgNO3.

RESULTS

Temperature :

The monthly average values of air temperature and surface water temperature during the study period are given in table 1. The air temperature varied between 8·3°C in January and 37·6°C in July. The monthly average of water temperature varied from a maximum of 33°C in July to a minimum of 8·9°C in January.

Hydrogen ion concentration :

The pH of the surface water ranged between 7·2 and 7·8. In general pH values have showed slight differences throughout the year.

Dissolved oxygen :

The monthly average maximum and minimum values of 12·3 and 2·4 ppm were recorded for the dissovled oxygen in January and July respectively.

Cholorosity :

It is clear from the data that chlorosity showed slight variations, during the study period. The monthly average of chlorosity during the study period ranged between 0·043-0·058 ppt.

Population Cycle :

M. macrocopa :

Population size of *M. macrocopa* throughout the course of the study is given in Table 2. One population maxima occurred during October. This was 11815/L. During winter months the population density gradually decreased from 1145/L in November to 73/L in December. In early December 12% of the females were observed to carry ephippia. A few males were also observed in November and December. The percentage of the males were 8% and 6·5% respectively. However no reproduction could be noticed between January and August.

M. micrura :

M. micrura seems to have two population cycles during the year (Table 2). The first cycle was noticed to begin from the middle of August until the late of December, whereas, the second cycle begins from the middle of March until the late of June. Two peaks in the population have been noticed; one in October and the other was during April. These two peaks were 13125/L and 11000/L respectively.

DISCUSSION

A comparison between the population cycles of the *M. macrocopa* and *M. micrura* throughout the year, shows that there is a clear difference between the two species. As it was found *M. macrocopa* has been one developmental cycle, whereas, *M. micrura* has a dicyclic development. The numbers of the two species reached a maximum in October when the temperature having a range of 22-28·5°C.

At this time the population of *M. micrura* is very close in size to that of *M. macrocopa* although *M. micrura* has a

Table 1 : The seasonal changes in temperature, O_2, pH and chlorosity during the course of the study.

Months	Air temp.	Wat. temp.	O_2 (ppm)	pH	Chlorosity (ppt)
J	8·3	8·9	12·3	7·8	0·043
F	21·6	16·1	9·5	7·6	0·049
M	24·8	17·4	8·1	7·8	0·046
A	28	23·7	4·7	7·4	0·047
M	29·1	20·3	5·2	7·2	0·046
J	33·4	30 6	3·8	7·4	0·043
J	37·6	33	2·4	7·7	0·042
A	35·1	27·1	4·1	7·3	0·051
S	34·1	27·3	4·2	7·5	0·053
O	30·5	24·3	4·6	7·3	0·058
N	26·3	19·5	5·4	7·8	0·051
D	17·1	13·2	6·7	7·8	0·049

Table 2 : The seasonal variations in the populations of **M. macrocopa** and **M. micrura** during the course of the study.

	Jan	Feb	Mar	Apr	May	Jun
M. macrocopa	0	0	0	0	0	0
M. micrura	0	0	200	11000	4380	450
	Jul	Aug	Sept	Oct	Nov	Dec
M. macrocopa	0	0	248	11815	115	73
M. micrura	0	350	9800	13125	2450	4

carapace differ in size to that of *M. macrocopa*. The maximum lengths during October were 1·3 and 1·8 mm. respectively. It seems from the results that the two species could not co-evist for a long period of time since it was noticed populations of both species decline and then they disappear later (Table 2). Although the two species are belonging to the same genus (*Moina*) it appears that they have no similar response to environmental factor. The comparison of results and observation in nature shows that the two species completely disappear from the field in January when the temperature having a range of 4-9°C. However, *M. micrura* occurs in the field five to six month earlier than *M. macrocopa*. Terao and Tanaka (1928) have investigated the effcts of various temperatures upon reproduction of *M. macrocopa* and found that the minimum temperature of tolerance is 8°C. Brown (1929) also found that the same species did not reach sexual maturity at 10°C. Similar observation have also been obtained under laboratory conditions for *M. micrura* (Shihab 1977).

Johnson (1952) concluded that the low temperature was the most important single physical factor in determining the life cycle of *M. macrocopa*. A similar finding was also noticed during the course of this study. On the other hand, no reproduction could be seen for the two species in July This indicates the response of *M. micrura* and *M. macrocopa* to high temperatures. Terao and Tanaka (1928) have also reported that no reproduction of *M. macrocopa* could be noted at 39°C. Similar results were also obtained for *M. micrura* at 38°C by Shihab (1977). Although the ability of both species to tolerate extreme temperatures is quite similar. there was a clear difference in the time of their reproduction. The reproduction of *M. macrocopa* was found to take place from 2nd September until late of December while that of *M. micrura* takes place from 15th

March till late of July and from 13th August till late of December. Such a difference would probably due to the unfavourable hatching conditions for the resting eggs of the optimal hatching conditions of this species only within a very limited period of time.

SUMMARY

One year study on the seasonal population changes in *Moina macrocopa* Strauss and *Moina micrura* Kurz as observed in Zoafaraniyah pools, Baghdad, Iraq is presented and discussed.

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الخلاصة

شمل البحث الحالي دراسة ميدانية للتغيرات الموسمية في كثافة نوعين من براغيث الماء خلال الفترة الواقعة من (١ تموز ١٩٧٦ ، ٣٠ حزيران ١٩٧٧) في مزرعة الاسماك التجريبية في الزعفرانية ، وقد تم تحديد درجتي حرارة الماء والهواء والاوكسجين المذاب وتركيز ايون الهيدروجين والكلور خلال تلك الفترة ومدى ارتباطهم بالكائنتين المذكورتين . ووجد بأن المونيا ماكروره لها دورتين حياتيتين ، الدورة الاولى بدأت من ١٥ اذار وحتى اواخر حزيران ، اما الدورة الثانية فقد بدأت من ١٣ آب وحتى اواخر كانون الاول ، في حين اظهرت المونيا ماكروكويا دورة حياة واحدة بدأت من ٢ ايلول وحتى اواخر كانون الاول.